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Institute of Vitreous Enamellers

When the Institute of Vitreous Enamellers met at Cardiff last week for its 11th annual meeting, there was a new atmosphere prevailing. For nearly half of its life, the Institute has been frustrated in its activities by war conditions. Now it feels that it is face to face with the realities of a new world—a world hungry for its products. There was a complete appreciation of the extraordinary difficulties which lie ahead, outstanding amongst which is the appalling dearth of qualified men. The five years of pre-war existence was too short a time for a new Institute to embark upon an objective educational policy, although each president, the late Dr. Mellor, Sir Harold Hartley and Mr. W. H. Whittle, warned the members of the necessity of attracting to the industry the necessary scientifically-trained men. Again, the industry is not a large one and does not possess unlimited capital resources to embark on large-scale educational and research enterprises.

One of the guests, Lieut.-Col. Percy Thomas, the president of the Royal Institute of British Architects, pleaded for more attention to be given to design, as "good design meant good business." Whilst supporting this with the utmost force at our command, we still adhere to the basic notion that quality and efficiency must not be allowed to suffer. Some of the most pleasing overseas designs of gas cookers rank amongst the most thermally inefficient on the market. Britain is shabby just now, but if personal and household goods had only been well designed and not well made in pre-war days, the population would have been reduced to loin cloths and wigwams. A great future awaits the enamelling industry and we are confident that with the help of the Institute we can look forward with confidence to improved design and the maintenance of a high standard of quality.

Institution of Metallurgists

Last Thursday there was held the inaugural meeting of the Institution of Metallurgists. Unlike many of the older institutions which it is destined to emulate, it has entered the world under the most auspicious circumstances. There is the enthusiastic co-operation of the Iron and Steel Institute and the Institute of Metals, whilst the audience at the meeting included a representative cross-section of the higher branches of the profession. Men well-known internationally as research workers, professors, consultants and production men filled the large hall at Grosvenor Gardens to capacity.

The object of the meeting was to provide an answer to the question "Why another metallurgical association?" Put quite simply the Institution of Metallurgists is to be a *qualifying* body, which the older ones are not and could only be made so with the greatest difficulty. A percentage of the profession possesses a university degree or diploma in metallurgy, but many others have achieved eminence after either a practical training or by transferring from pure science. By bringing all those suitably qualified into one corporate body, there will come into being an Institution well qualified to direct such activities as training standards and facilities; professional conduct, and generally to guard and promote the welfare of metallurgists in all its aspects.

The most important feature of the new Institution is the fact that no member of the Council has anything to gain from all the work they have put into its creation, for, without exception, they have secured for themselves positions of eminence in the world of metallurgy. They are merely a "caretaker government" acting on behalf of the rising generation. This altruistic attitude commands the enthusiastic support of all those who are now practising metallurgists. For the younger members of the profession they must strive to attain the requisite standards for admission. To both these categories we counsel that they write to the secretary, Mr. K. Headlam-Morley, at 4, Grosvenor Gardens, London, S.W.1.

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FORTHCOMING EVENTS

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

DECEMBER 7.

Institute of Welding (South London branch):—"Welding of Plastics," by Dr. Hain and Dr. Zade. At Borough Polytechnic, Borough Road, London, S.E.1, at 7.30 p.m.

DECEMBER 12.

Institute of Welding (Eastern Counties branch):—"Electric Stud Welding and Welding Transformers," by A. H. Bent. At Ipswich.

Institute of Welding (North London branch):—Question Night. At Acton Technical College, at 8 p.m.

DECEMBER 14.

Institute of Welding (Birmingham branch):—"Fabrication and Welding of Bridging Equipment," by R. G. Braithwaite. At the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.30 p.m.

Keighley Association of Engineers:—Films on Mulberry Harbour, Operation Pluto, Bailey Bridge, and Valley of the Tennessee. At Devonshire Buildings, Devonshire Street, Keighley, at 7.30 p.m.

Institution of Mechanical Engineers:—"Some Notes on the 'Merchant Navy' Class Locomotives of the Southern Railway," by O. V. S. Bulleid. At Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m.

Staffordshire Iron and Steel Institute:—Open discussion: "How Far Can Iron Castings Replace Steel?" At the Dudley and Staffordshire Technical College, The Broadway, Dudley, at 7 p.m.

DECEMBER 15.

Manchester Association of Engineers:—Conversazione and dance. At the College of Technology, Manchester.

DECEMBER 17.

Sheffield Society of Engineers and Metallurgists:—Annual general meeting. "Colour Television," by L. C. Jesty. At the Royal Victoria Station Hotel, Sheffield, at 6.15 p.m.

Institute of British Foundrymen

DECEMBER 8.

Newcastle-upon-Tyne branch:—Open discussion on foundry problems. At the Neville Hall, Newcastle-upon-Tyne, at 6 p.m.

Scottish branch:—"Castings Inspection," by P. Cook. At the Royal Technical College, George Street, Glasgow, at 3 p.m.

West Riding of Yorkshire branch:—"Training Problems in the Foundry," by G. W. Green. At the Technical College, Bradford, at 6.30 p.m.

DECEMBER 15.

Bristol and West of England branch:—Visit to the works of the National Smelting Company, Limited, Avonmouth, at 10 a.m. "Pressure Die Casting," by G. T. Vicary. At the Merchant Venturers' Technical College, Bristol, at 7 p.m.

East Midlands branch:—"Some Principals of Production Control and Their Application to the Manufacture of Steel Castings," by A. B. Lloyd. At Loughborough College, at 6 p.m.

DECEMBER 21.

Falkirk section:—Short Papers. At the Temperance Café. Lint Riggs, Falkirk, at 7 p.m.

A FACTORY for the manufacture of ball bearings is now in production at Stewarton, Ayrshire. The owners are the Carrick Engineering Company, whose wartime work was the manufacture of component parts and tools for the Ministry of Aircraft Production.

A NEW LIGHT ALLOY CAR

The patent rights to the car designed by J. A. Gregoire, which the French Government has chosen to be manufactured as the "National Car," have been secured for this country, and will form the basis of a design specially adapted to British requirements. This car embraces many novel features, the chief of which is that the main structural members are made up of aluminium castings, a feature which offers great economies in production cost.

This four-seater, front-wheel drive car weighing only 800 lbs., is powered by an air-cooled, 594-c.c. engine which gives the remarkably low petrol consumption of 71 miles per gall. at 30 m.p.h., and a top cruising speed of 60 m.p.h. The gearbox is of the four-speed type with "overdrive" top gear. There is independent suspension on all wheels. Its manufacture in this country will be undertaken by Mr. W. D. Kendall, M.P., of Grantham Productions, Limited, who will also manufacture tractors and other cars. It is hoped to maintain an output of 500 cars per week.

The new car has been so designed as to take full advantage of the remarkable combination of lightness and strength offered by modern aluminium alloys, and of the highly-developed production techniques which have been evolved during the war. It is anticipated that the advantages derived from the extensive use of light alloys in this car will create a wide interest in the form of construction employed and that it will be incorporated in other manufacturers' designs. For the manufacture of the aluminium alloy castings, which fulfil the most important functions in this car, the resources of Renfrew Foundries, Limited, owned jointly by Almin, Limited, and Rolls-Royce, Limited, will be available.

METAL-POWDER SINTERED BEARINGS

A Committee on Metal Powders and Metal Powder Products is one of the newer technical groups of the American Society for Testing Materials. Specifications covering metal-powder sintered bearings (oil impregnated) are its first recommendation. Two types of bearings are provided for: bronze-base and iron-base, with two classes in each. Class A, bronze-base, has a range of copper of 87.5 to 90.5 per cent.; tin, 9.5 to 10.5; carbon, 1.5 max., and a maximum of other elements of 0.5. In comparison, Class B requires 82.6 to 88.5 copper; 9.5 to 10.5 tin, and in addition shows maximum permissible quantities of 2.0 to 4.0 per cent. lead; 0.75 zinc; 0.35 nickel; 0.25 antimony. Class A, iron Type II, has a minimum of 95.0 iron; carbon can range from 0.5 to 2.0, with other elements 3 per cent. maximum. For Class B the copper range is from 5 to 30 per cent., with total iron plus copper not less than 97 per cent. The density in grammes per cubic centimeter ranges from 5.7 to 6.9 max. for the various classes and types. Porosity in terms of interconnected void space by volume must be not less than 18 per cent. for all classes.

A NEW METHOD OF FEEDING APPLIED TO CASTINGS MADE IN STATIC MOULDS

A study of one of the most recent advances in the production of castings

By S. T. JAZWINSKI, Dpl.-Ing. Met., and S. L. FINCH

(*Continued from page* 274.)

Results at Varying Pressures

To obtain more evidence with regard to different pressures employed, a casting was made employing a pressure of approximately 15 atmospheres. The result obtained was extremely interesting, as shown in Fig. 9. The cavity is practically the whole of the feeder head and more or less a complete shell. The thin shell or case of solidified metal obviously acted as a cylinder, whilst the gas pressure acted as a piston and the liquid

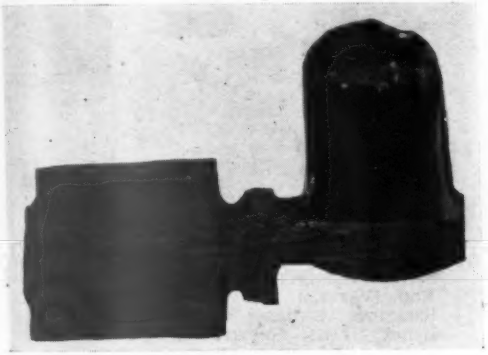

FIG. 9.—SHOWING SECTIONED HEAD AND CASTING WHEN A PRESSURE OF APPROXIMATELY 15 A.T.M. WAS EMPLOYED.

steel was the medium compressed. Radiological examination showed the casting to be sound, and the yield of casting to liquid metal was quite close to the theoretical limits.

In Fig. 10 is shown a feeder head which was used with a still greater pressure of approximately 30 atmospheres. The pressure employed was too great and the mould top was lifted, and the back pressure was so great that the metal was pushed through the thin solid shell forming the contour of the casting. The feeder head is only a thin case of neck and head contour, with a thickness of $\frac{1}{16}$ in. on top, $\frac{1}{4}$ in. on the bottom, and $\frac{1}{16}$ in. in the neck. The bowl is $\frac{1}{4}$ in. thick in solid metal, and the surface of the metal was smooth and polished.

This section of the article shows in a clear manner the shrinkage cavity which can be obtained when feeding a casting, utilising gas pressure, and at the same time having regard to the fundamental physical laws governing gating and feeding.

To conclude this section a comparison between the gravity, atmospheric, graphite rod (vertical), graphite rod (horizontal), and gas pressure heads is shown in Fig. 11, wherein the comparison between these types of cavities shows the improvement in effective use of head metal following use of gas pressure.

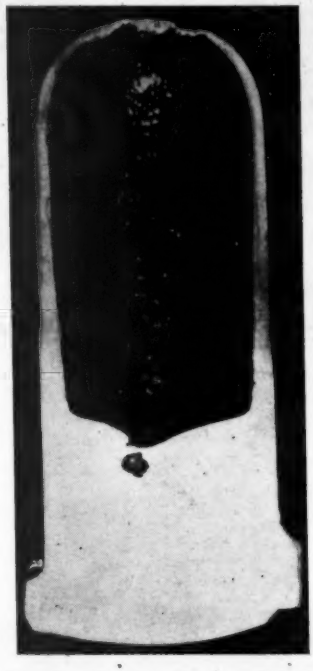

FIG. 9A.—SIMILAR CASE TO FIG. 9.

Production of Castings Using the Gas-pressure Head

Fig. 12 shows the first casting made using controlled gas pressure. This is a simple bearing cap, which had given trouble in the past using normal gravity heads. A low yield was obtained with excessive cutting off and dressing operations, and, in addition, it was difficult to obtain a completely sound casting. The introduction of the atmospheric head resulted in increasing the yield from 40 to 55 per cent. and reducing

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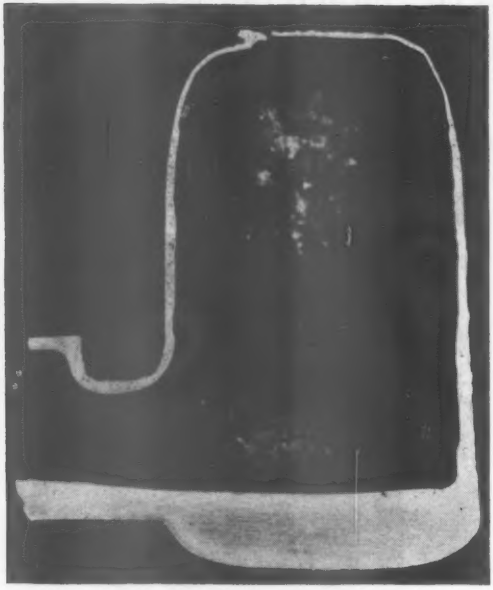
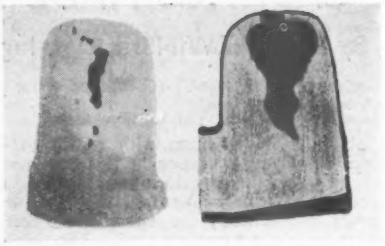


FIG. 10.—SHOWING SECTIONED HEAD IN WHICH A PRESSURE OF APPROXIMATELY 30 A.T.M. WAS EMPLOYED.



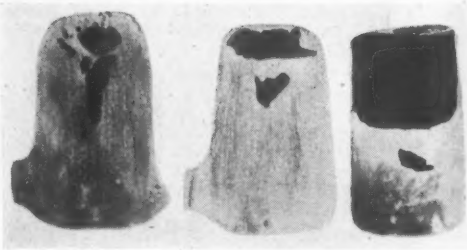


FIG. 11.—SECTIONED HEADS SHOW COMPARISON BEWEEN THE GRAVITY, ATMOSPHERIC, GRAPHITE ROD (VERTICAL AND HORIZONTAL) AND GAS PRESSURE. SECTIONS THROUGH FIVE TYPES OF BLIND HEAD: GRAVITY (TOP LEFT), ATMOPHERIC (WILLIAMS) (TOP RIGHT), VERTICAL GRAPHITE ROD (BOTTOM LEFT), HORIZONTAL GRAPHITE ROD (BOTTOM CENTRE), GAS PRESSURE (BOTTOM RIGHT).

FIG. 12.—SHOWING BEARING CAPS CAST BY A NEW METHOD (YIELD 55 PER CENT.).

FIG. 13.—SHOWS PLANE ALONG WHICH BEARING CAPS WERE SECTIONED.

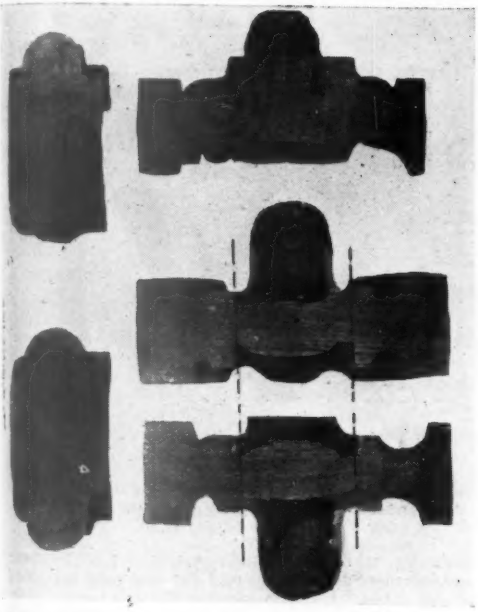


FIG. 14.—SHOWING SECTIONED BEARING CAPS.

FIG. 15.—SHOWS BRACKET CAST BY A NEW METHOD (YIELD 63 PER CENT.).

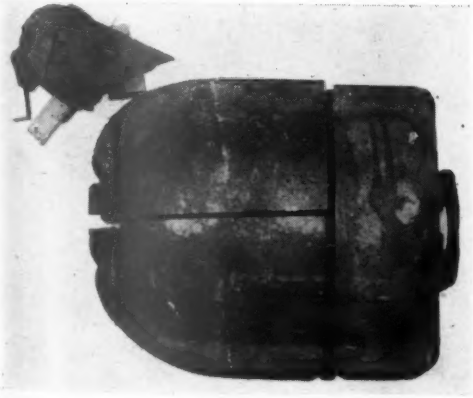


FIG. 16.—SHOWS PLANES ALONG WHICH BRACKET WAS SECTIONED.

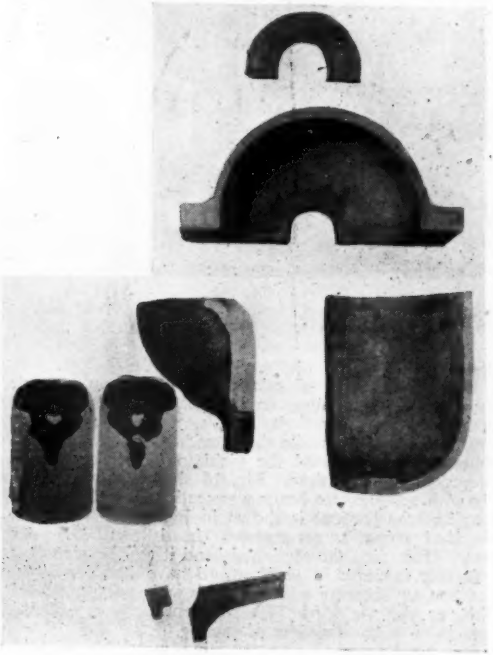


FIG. 17.—SHOWING SECTIONED BRACKET.

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the dressing time. The gas-pressure head resulted in the casting, as shown in Fig. 12. Fig. 13 shows these castings sectioned in the positions where shrinkage cavities may occur. The sectioned castings are shown in Fig. 14 and are perfectly sound. The head cavity is very interesting, showing the flat-bottomed type of cavity with small secondary shrinkage. The use of the gas-pressure head raised the yield from 55 to 70 per cent., resulting in a saving of 336 lbs. liquid steel per ton of castings produced.

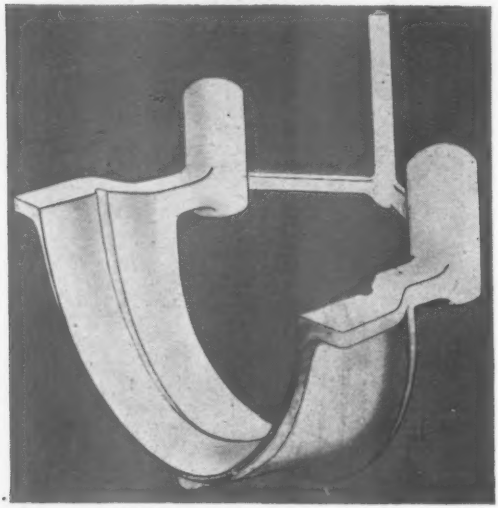

FIG. 18.—SHOWS A CYLINDER COVER CASTING CAST BY A NEW METHOD (YIELD 71.4 PER CENT.).

Fig. 15 shows a simple casting which was made using the gas-pressure feeder head. Utilising the orthodox type of gravity heads, a yield of 50 per cent. was possible, while the introduction of the atmospheric head increased the yield to 63 per cent. with decreased dressing time. Fig. 16 shows where a casting with gas-pressure heads was sectioned, and a photograph of the sections is shown in Fig. 17. The yield obtained using a gas-pressure head was 73.9 per cent. Observing the sectioned head it can be seen that a further increase in yield would have been possible, but due to pressure of work, this was not proceeded with, as the yield of 73.9 per cent. was considered impressive with this type of casting.

Fig. 18 shows a cover casting which is slightly heavier and more complex than the previous illustration. Using gravity heads a yield of 52 per cent. was

FIG. 19.—SHOWING SECTIONED CYLINDER COVER.

obtainable, whilst the introduction of the atmospheric head increased the yield to 61.7 per cent. and decreased dressing costs. Using a gas-pressure head a perfectly sound casting was produced (see Fig. 19) with a yield of 71.4 per cent. The sectioned head shows more secondary piping than usual, although once again the flat-bottomed cavity is exhibited.

Fig. 20 illustrates a tram wheel which had been

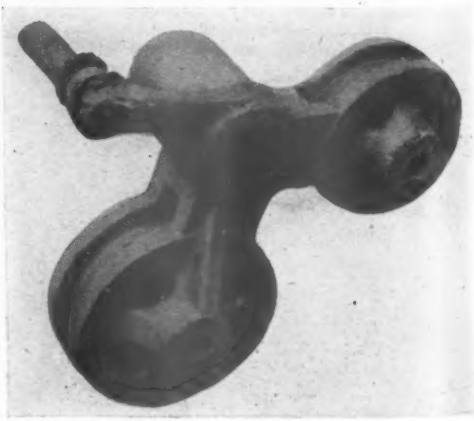

FIG. 20.—SHOWS A TRAM WHEEL CAST BY A NEW METHOD (YIELD 59.2 PER CENT.).

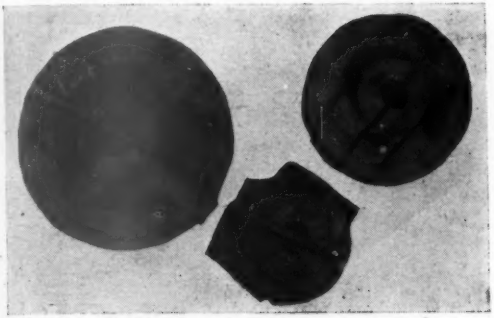

FIG. 21.—SHOWS PLANES ON WHICH TRAM WHEEL WAS SECTIONED.

made in the past using gravity heads giving a low yield of 47.4 per cent., although sound castings were produced. When an atmospheric head was used (see Fig. 20) this had to be of the double-necked type, and a comparatively low yield of 59.2 per cent. was obtained, although the decreased dressing costs were pronounced. The gas-pressure type of head was applied to the casting, and again a double-necked type of head was necessary, which does not lend itself to exceptionally high yields. A sectioned casting produced using a gas-pressure head is shown in Fig. 22. Fig. 21 illustrates the method of sectioning the casting, and a careful examination of the sectioned casting shows that changes in section do not affect the soundness of this casting, which was produced with a yield of 70.6 per cent. The section through the feeder head shows the typical globular cavity associated with gas-pressure heads with a small amount of secondary shrinkage.

The stub axle bracket shown in Fig. 23 was produced by means of a gas-pressure head, with a yield of 88.1 per cent., as against 48 per cent. using gravity heads and 65 per cent. using the atmospheric head. The next casting illustrated has been chosen to show

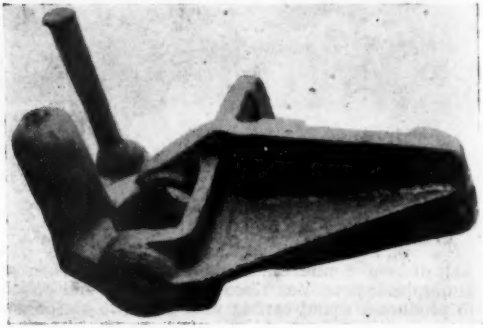

FIG. 23.—SHOWS AN AXLE BRACKET CAST BY A NEW METHOD (YIELD 88.1 PER CENT.).

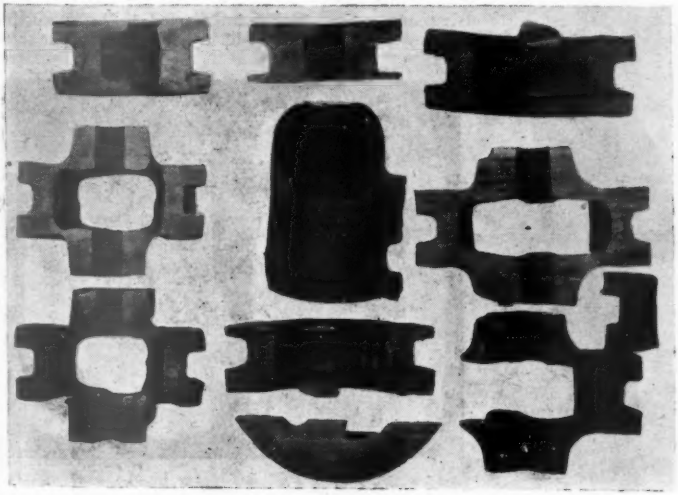

FIG. 22.—SHOWING SECTIONED TRAM WHEELS.

that the heavier sections of a compact casting prove to be free from internal defects when made with a gas-pressure head (see Fig. 25). The yield obtained in this particular case was 76 per cent., as against 63.9 per cent. using the atmospheric head.

Application to Heavier Castings

After the methods of gas-pressure heads had been successfully applied to smaller castings, those of the heavier type were made, with no special precautions being taken, and, as shown in Fig. 26, the gear case was produced with two gas-pressure heads at the sides and one atmospheric head in the centre. The yield obtained in the production of a sound casting was 80 per cent. The sections of the gas-pressure heads are shown in Fig. 27. Although this casting was produced successfully with these three heads, it was decided to try to make this gear case without the

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FIG. 24.—SHOWS A BRACKET CAST BY A NEW METHOD (YIELD 76 PER CENT.).

aid of the centre atmospheric head. When the atmospheric head was removed, it was found possible to produce a sound casting with only two gas-pressure heads, raising the yield from 80 to 87.1 per cent. (see Fig. 28).

FIG. 25.—SHOWING SECTIONED BRACKET.

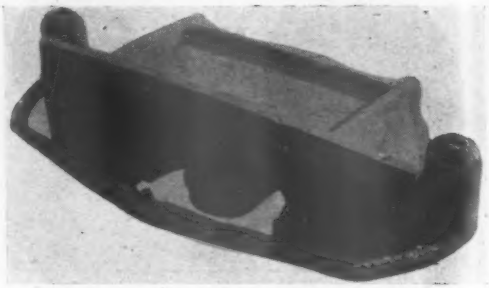

FIG. 26.—SHOWS A GEAR CASE CAST BY A NEW METHOD (YIELD 80 PER CENT.).

Having made castings the weights of which ranged from a few pounds up to 500 lbs., castings were chosen on account of their intricacy or bad design where the founder usually experiences trouble. The valve body shown in Fig. 29 was cast, two in each moulding box using three gas-pressure heads for the two castings. One valve body is shown sectioned in Fig. 30, which was satisfactory with a yield of 67 per cent.

The roller bracket shown in Fig. 31 is an example of where a sudden change in section occurs frequently throughout the casting. This either leads to low yield, due to excessive head metal, or with heads of normal size trouble due to shrinkage. The method of feeding using one gas-pressure head proved to be successful, as shown in Fig. 32, with a yield of 76 per cent.

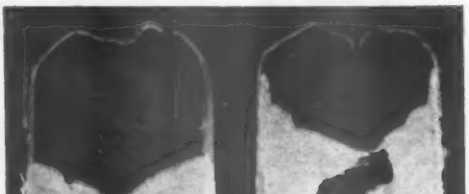

FIG. 27.—SHOWS SECTIONED HEADS FROM GEAR CASE CASTING.

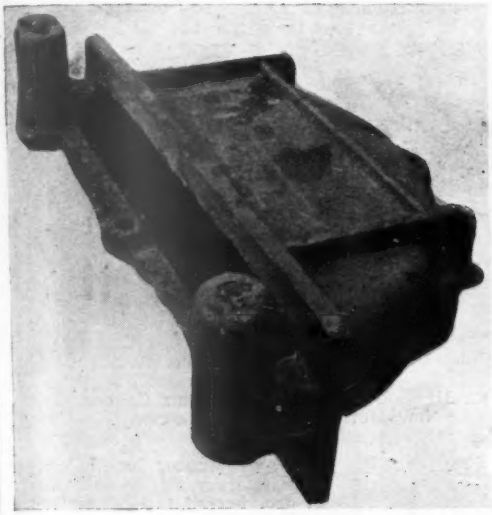

FIG. 28.—SHOWS GEAR CASE CAST WITH TWO FEEDING HEADS ONLY (YIELD 87.1 PER CENT.).

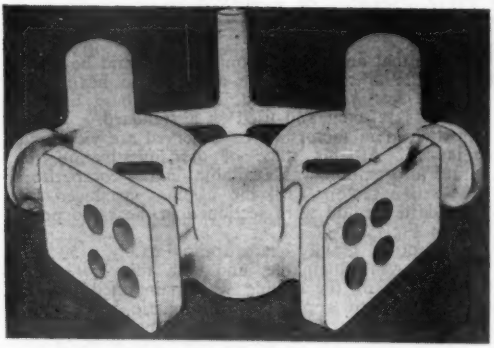

FIG. 29.—SHOWS A VALVE BODY CAST BY A NEW METHOD (YIELD 67 PER CENT.).

Many illustrations of various designs and sizes of castings could be shown, but it is felt that the examples given show the advantages of this new method, but before closing this section it is of interest to illustrate the girder casting in Fig. 33. This casting weighed approximately 300 lbs., and was successfully fed using only one gas-pressure head, and the sectioned castings and head are shown in Fig. 34. The sections show that a sound casting was produced, whilst in the head a meniscus is clearly shown. Practically the theoretical yield was obtained on this casting, namely, the exceptionally high figure of 95.1 per cent.

Comparison Between Gas-pressure Feeding and Other Static Methods

A comparison has already been made between the atmospheric type of head and the gravity head in a previous Paper by the Authors,[2] in which the advantages of the former were stressed. At this state a comparison between the three static methods of feeding, *i.e.*, gravity, atmospheric and gas-pressure heads, will be useful in illustrating the economic aspect of the latter. Full comparisons have been made and graphs drawn to show the performances of the various types of feeder heads. The two most efficient methods of feeding, that is utilising atmospheric and gas pressure, are compared further in the following experi-

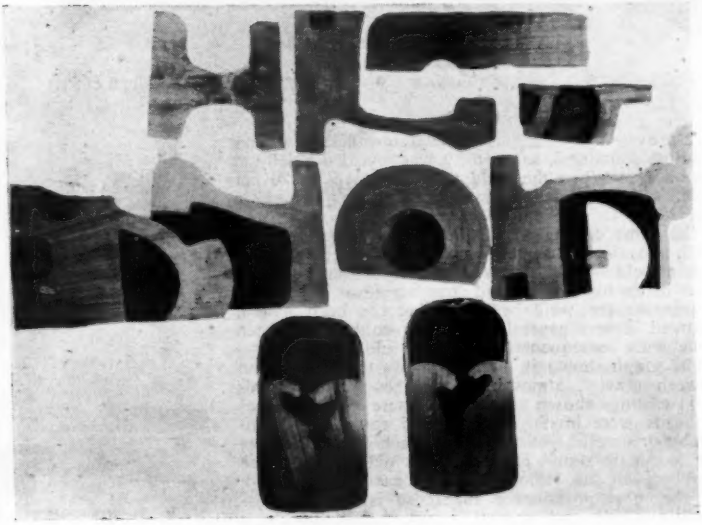

FIG. 30.—SHOWING SECTIONED VALVE BODY.

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ment. So that an accurate comparison could be made between the efficiency of an atmospheric head with that of a gas-pressure head, a spring base bracket casting was selected and used as a standard.

The two main factors to be observed are yield and soundness. At this stage of the investigation no accurate information was available on the comparison of these two factors. All the castings produced by the standard method were sectioned in the same position (see Fig. 36).

Using normal gravity heads approximately a 50 per cent. yield was obtainable, and with this low yield the soundness of the casting was maintained. The next step was to apply the atmospheric head, and, when the method of feeding and gating the casting was standardised, as shown in Fig. 35, a yield of 75.9 per cent. was obtained, but, as will be seen from Fig. 37B, the casting was unsound, and exhibited shrinkage cavities in several of the sections. A further decrease in yield to 73.2 per cent. (Fig. 38C) still proved the atmospheric head insufficient to give absolute soundness, as porosity was revealed chiefly at T-sections. When the yield was decreased to 70 per cent., a sound casting was produced, as shown in Fig. 38D.

The same casting was made using the gas-pressure head, and a sound casting was produced (see Fig. 37A) with a yield of 84.2 per cent. Further sound castings were made by this method, but no effort was made to increase the yield by decreasing the head height, although it was generally felt this could have been made with consequent increase in yield.

The graph shown in Fig. 39 shows the comparison between gravity, atmospheric and gas-pressure heads on 11 castings chosen at random, where all three types of heads were investigated (proved sound by radiography or careful sectioning). In each case the object was to obtain sound castings. The difference can be seen between the atmospheric and gas-pressure head, but the most pronounced difference is between gas-pressure heads and normal gravity heads, which is shown to be an average of 30 per cent. higher yield for the gas-pressure head. Summarising, it should be said that not one, but all factors must be considered in designing the gating and feeding system of any one casting. After this can be studied the question of using pressures higher than atmospheric.

This pressure is caused by gas, and it can only be effective if it acts on the whole liquid mass of metal in the riser. Due to high conduction losses, the initial heat of the steel is not sufficient to

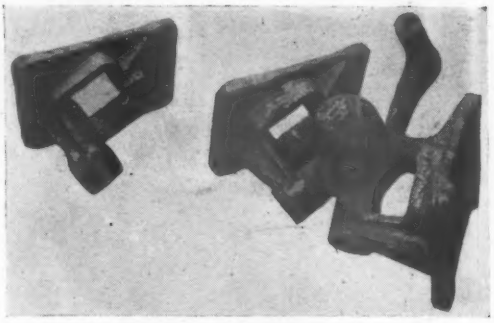

FIG. 31.—SHOWS A ROLLER BRACKET CAST BY A NEW METHOD (YIELD 76 PER CENT.).

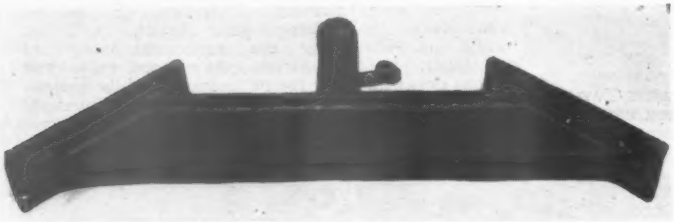

FIG. 33.—SHOWS A GIRDER CAST BY A NEW METHOD (YIELD 95.1 PER CENT.).

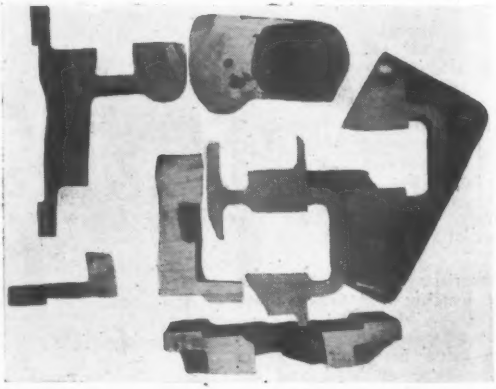

FIG. 32.—SHOWING SECTIONED ROLLER BRACKET.

keep the whole mass of metal in the feeder head fluid for any length of time, and so, to maintain fluidity, it is necessary to add additional heat energy in the feeder head or to lower the solidification temperature of the metal or both.

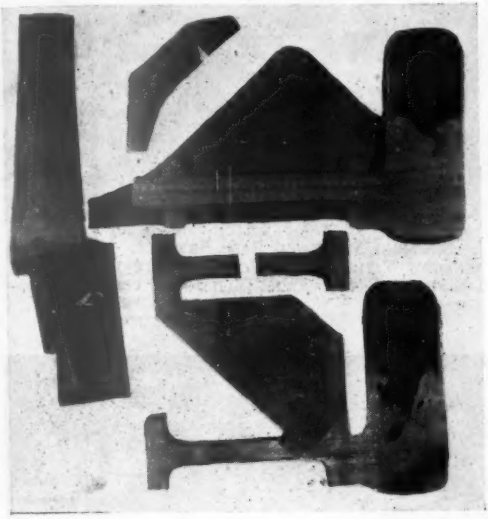

FIG. 34.—SHOWING SECTIONED GIRDER.

Exothermic Reaction

The gas-producing compound used contains a certain amount of material giving an exothermic reaction on being subjected to heat which maintains the head fluid for a longer period of time, and in so doing allows the pressure to be exerted on the whole area of the head, resulting in the meniscus effect.

So that a control of gas pressure can be established, a relation between gas evolution and the compound has been determined. It has not, so far as the Authors are aware, been previously appreciated that liquid shrinkage is constantly tending to create a partial *vacuum* in the casting. High gas pressure in the feeder head pushes the liquid metal from the head to the casting, preventing the formation of the *vacuum*. Each successive amount of shrinkage in the casting is compensated for by additional fluid metal forced in from the head due to this gas pressure. In addition, the shape of the shrinkage cavity in the head irrespective of the casting temperature can be correlated with the applied pressure.

This development was introduced into the foundry with which the Authors are connected and various

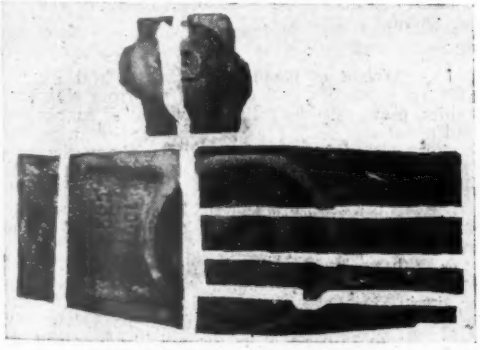

FIG. 36.—SHOWS PLANES ALONG WHICH THE BASE BRACKET WAS SECTIONED (FIG. 35).

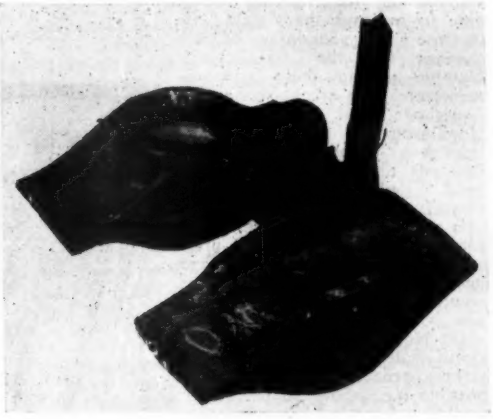

FIG. 35.—SHOWS A BASE BRACKET CAST BY A NEW METHOD.

castings were made. Sound castings were obtained with yields varying from 75 to 95 per cent. With the same type of castings, yields of 60 per cent., using gravity feeding, have been considered good in the past. Moreover, these gas-pressure yields are higher than other methods of castings (including centrifugal casting).

CONCLUSIONS

(1) In steelfoundries using normal types of gravity feeding heads (with open tops or as blind heads) the normal yield (*i.e.*, yield of castings to liquid metal used) is in the order of 50 per cent. If any higher average yield than this is obtained, it is generally at the expense of soundness in the castings. Admit-

A New Method of Feeding

tedly for certain types of castings, perfect soundness is not necessary to give reasonable performance in service. The inefficiency of the normal open-topped head is due to the head quickly freezing over, and thus the only pressure forcing the used metal into the casting to compensate for liquid shrinkage is that of gravity. atmospheric pressure is only additionally exercised so long as the head is kept open to atmosphere.

(2) Research work in recent years on the feeding of steel castings has resulted in methods being developed which have resulted in the founder being able to improve the "yield" or increase the soundness of the castings for the same yield. Notable among these improvements are what are known as the "swirlgate head" (developed by Hopkinsons, Limited, and the English Steel Corporation, Limited) and the "atmospheric head" developed by Williams. Centrifugal casting with vertical axis machines utilising centrifugal force to secure high liquid pressure to compensate for shrinkage has the same object in view, *i.e.*, securing a high yield with soundness.

(3) None of the methods previously developed results in a yield approaching the theoretical possible (*i.e.*, about 90 per cent.). Centrifugal casting has previously most nearly approached this, but the field for centrifugal castings is limited and the equipment is expensive and the technique lengthy and expensive to acquire for differing types of castings.

(4) By studying the fundamental laws and requirements governing the production of castings with high yield, the method of feeding described in this article has been discovered and developed. This is capable of being easily used in foundries and gives high yields and sound castings. The article shows also that the efficiency of feeding is proportional to the pressure applied to the head metal.

(5) This method (called for convenience the gas-pressure head) achieves two main objects:—(*a*) Forces the head metal into the casting to compensate for liquid shrinkage at pressures hitherto quite unobtainable in practice; and (*b*) maintains the fluidity of the head for a sufficient length of time to enable a large proportion of the head metal to be effectively used.

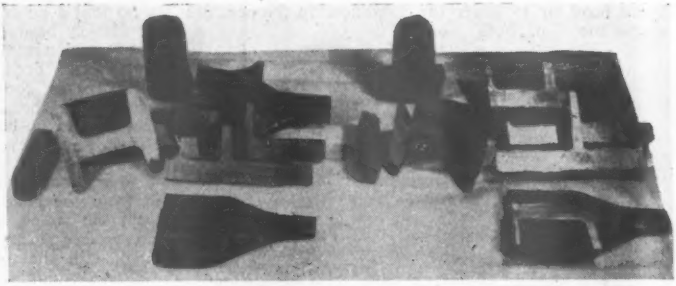

FIG. 37.—SHOWING SECTIONED BASE BRACKET.
(A, LEFT, GAS PRESSURE, YIELD 75.9 PER CENT., CASTING SOUND; B, RIGHT. ATMOSPHERIC PRESSURE, YIELD 75 PER CENT.. CASTING UNSOUND.)

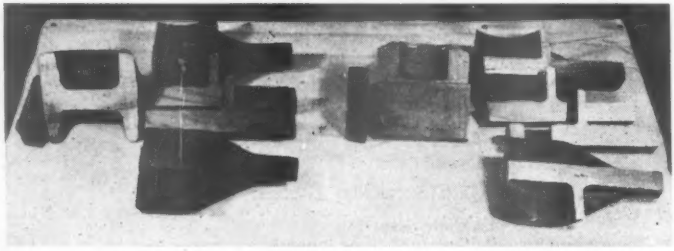

FIG. 38.—SHOWING SECTIONED BASE BRACKET.
(C, LEFT, ATMOSPHERIC PRESSURE, YIELD 73.2 PER CENT., CASTING UNSOUND; D, RIGHT, ATMOSPHERIC PRESSURE, YIELD 70 PER CENT., CASTING SOUND.)

Weight of Runner and Head Metal

(6) To produce sound castings free from shrinkage cavities, previously the following weight of runner and head metal was needed on the average:—With normal gravity heads, 100 per cent. of the weight of the casting; with "atmospheric" heads, 60 per cent. of the weight of the casting; with vertical axis centrifugal casting, 40 per cent. of the weight of the casting; with gas-pressure heads, 15 per cent. of the weight of the casting.

(7) With gas-pressure heads, yields of 80 to 95 per cent. can be regularly obtained with full compensation for liquid shrinkage, *i.e.*, complete soundness. Thus the weight of runner and head metal needed is only 6 per cent. to 25 per cent. of the weight of the casting.

(8) Means of producing and controlling gas pressure in the heads have been determined as well as means of delaying the production of gas pressure until

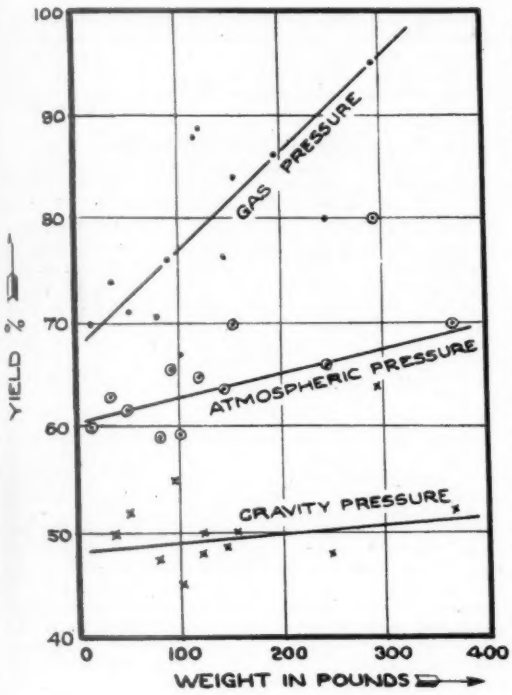

FIG. 39.—SHOWS RELATION BETWEEN WEIGHT OF THE CASTINGS IN LBS. TO THE YIELD IN PER CENT. IN DIFFERENT FEEDING ARRANGEMENT.

the head has formed a gas-tight skin and means of securing the production of additional heat as well as gas pressure.

(9) Experimental data and examples are given showing both the theoretical considerations underlying this method and the resultant development in practice. The method of feeding using gas pressure is used in conjunction with all other known laws governing feeding and can therefore be used to promote maximum efficiency in feeding. For example, promotion of directional solidification as is done also with the atmospheric and whirlgate head.

Acknowledgments

The Authors are indebted to the managing director, Mr. F. W. Rowe, B.Sc., for his helpful criticism and encouragement, the work being carried out in the K. & L. research laboratories and foundry. Thanks are due to the foundry personnel for help in the productive application of this development. Finally, the Authors record their sincere thanks to the directors of K. & L. Steelfounders & Engineers, Limited, for permission to publish information included in this article.

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2 S. T. Jaswinski, E. D. Wells and S. L. Finch, "The Gating and Feeding of Steel Castings," Paper No. 829, 42nd annual meeting, Institute of British Foundrymen, June, 1945.

AMERICAN WARTIME DEVELOPMENTS IN GREY-IRON FOUNDRY PRACTICE

This study, written by Mr. J. S. Vanick on behalf of the American Foundrymen's Association, was presented as an Exchange Paper to the French foundry congress recently held in Paris. The Paper outlines the modifications which were carried out for increased production consequent upon the war. The production of alloys, rationing and Government price control were detailed as well as such activities as the setting up of technical committees by employers' associations to control specifications, new processes, and the scientific study of foundry products. The readjustment to war needs brought about numerous problems as to alloying and raw materials, with the object of either modification or conservation.

Thereafter, the Paper details the progress in the direction of the increased use of synthetic sands. Efforts have been made to standardise upon one mixture to serve both moulding and core shops. A method of mould production using a circular table in conjunction with conveyors tends to save labour and give higher output. Limited floor space has brought about the stacking of moulds before casting and to seek by every means an increase in production. There have been improvements in the making of centrifugal castings and in methods destined to effect precision of an order so fine as to eliminate machining. Melting methods have been geared to meet the needs of an ever-increasing production. Automatic weighing and charging have become normal practice.

Melting of Turnings

The melting of turnings in the cupola has been developed with the object of conserving raw materials and alloys. The use of hot blast or dried air is favourable to regular operation and quality production. Control has been simplified by the use of inoculants (deoxidisers, degasifiers, stabilising the graphite). These enable the foundryman to eliminate variables and to make material of uniform quality. By this means some firms have been regularly making irons of from 13 to 26.7 tons per sq. in.

Many iron castings have been regularly made within the tensile strength range of 22 to 42 tons per sq. in. which replaced in some cases steel castings, such as crankshafts and plating. Austenitic cast irons have also played their part in the war effort on account of their resistance to heat and corrosion and to their reduced growth on repeated heatings.

BOOK REVIEW

"Cast Iron in Building," by Richard Sheppard, F.R.I.B.A. Published by George Allen & Unwin, Limited, 40, Museum Street, London, W.C.1. Price 7s. 6d. net.

The importance of the subject matter of this book is rightly stressed by Mr. J. G. Pearce, the director of the British Cast Iron Research Association, in the foreword. He points out that in pre-war days, if civil engineering castings be included, the requirements of the builders absorbed about one-third of the total output of the ironfoundry industry, and that the near future may see this ratio attain even 40 or 50 per cent.

The book opens with a historical survey covering the early use of cast iron for buildings. The Coalbrookdale, the Buildwas, and the proposed Thames bridges are all described and illustrated, and the exhibition buildings of 1851 are designated as the first large-scale attempt at the prefabrication of buildings. Of these most foundrymen are aware, but it will be news to most that in 1836 Pugin published a book in which he "mercilessly guyed the ideas of the [Ecclesiastical] Commissioners in a plate [reproduced] which he entitled 'New Church, Open Competition,' and he dealt even more caustically with the misuse of cast iron in two lectures which he delivered at St. Marie's, Oscott." If only the authorities of the period had taken real cognizance of his advice, the prejudice against cast iron in architecture would never have materialised.

In the second section, the Author turns his thoughts to the production varieties and properties of iron; the foundryman is obviously familiar with the ground covered, but not so the man-in-the-street. Much the same remarks apply to section three—the casting of iron—but the average foundryman could with advantage pay serious attention to what the Author has to say on "Finishes and Surface Treatment of Iron." Herein are the possibilities of increasing sales, and expanding the usefulness of the material.

The reviewer appreciates to the full the comparison of the public appreciation of a brand new house and an old-fashioned house. He, too, wishes that buildings—especially industrial constructions—would sink when obsolete. The advent of steel reduced the consumption of cast iron in buildings for structural purposes, but in his section "Cast Iron in Building," the Author has assumed the role as technical sales director for the ironfoundry industry. He has certainly shown that a proper marshalling of the facts and close co-operation there could be a revival of what was at one time a really important and lucrative business. A slight yet common error appears on page 75, where the fact that the mould is destroyed after each cast has been forgotten. Finally, the Author outlines a few of the trends in building, and as an architect his views will repay careful study. After a comprehensive index, there are some 48 illustrations. Of these the reviewer was particularly interested in Plate 20, for herein is depicted a casting, 60 ft. wide by 43 ft. high, which consists of a window, surround, mullions and panels for the Plaza Constitucion Station, Great Southern Railway, Buenos Aires. It ranks amongst the most impressive castings ever made. "Cast Iron in Building" is an altogether delightful book, and one that should be read by all ironfounders.

V. C. F.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

SILICO-CALCIUM ADDITIONS

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—We were very much interested in your issue of November 15, as indeed we are in all issues, as this one contained a short extract from the Paper by G. Delbart, A. Thoret and R. Bucquet (page 200). May we point out, however, that the authors are of French nationality and attached to the firm Etablissements Cail, of Denain (Nord)? The Belgian Exchange Paper was by Mr. Halbart on "Martensitic Quench in Cast Iron."

The authors of the article you abstracted, after a further study of the question, have amended their Paper by interposing in the beginning a reference to the fundamental work published by Mr. Le Thomas, under the title of "Anomalies Shown by the Quench of Cast Iron—Influence of Oxidation." ("La Fonte," No. 10, 1933). The Paper pointed out *inter alia* the influence of additions and deoxidising treatments on grey irons and showed a distinct improvement in the properties of this material, through additions of a strongly-reducing element such as aluminium or silico-calcium, and, in particular, the elimination of the anomaly of "quench"; a decrease in heterogeneity of hardness in castings of varying sections and a lowered tendency to porosity.—Yours, etc.,

M. COUADE,
General Secretary.

Centre Technique des Industries
de la Fonderie,
46, Avenue Victor Hugo,
Paris, XVI.

U.S. IRON-ORE SUPPLIES

Discussing the drain on open-cast iron-ore reserves in the United States caused by the war, a writer in "Steel," pointing out that approximately 425 million tons of this high-grade ore were used from mid-1940 to the end of the Japanese war, suggests that should the beneficiation of the lower-grade Lake Superior ores lag and the reserves of the high-grade open-cast ores become exhausted, it is possible blast-furnace operators may turn to foreign ores, from South America and possibly the new discoveries in Labrador. While it is possible that these ores might be imported at a cost lower than that for beneficiated ores from the Lake Superior district, it would cause a trend of ironmaking toward the seaboard and might leave the United States largely dependent on foreign ores. Such a development, it is generally agreed, however, would be unthinkable in the light of possible future wars.

INSTITUTE OF VITREOUS ENAMELLERS

ANNUAL MEETING AT CARDIFF

The various interests in South Wales—civic, industrial and academic—co-operated to make the eleventh annual general meeting and conference of the Institute of Vitreous Enamellers, held at Cardiff on Thursday and Friday last, instructive and enjoyable. It was held under the presidency of Mr. J. W. Gardom.

The programme included a visit to the plants of Richard Thomas & Baldwins, Limited (particularly the new continuous hot and cold reduction strip mills), and of Curran Bros., Limited (automatic spray pickling machine and the plant which was originally developed for enamelling work but was turned over in wartime for the production of cartridge cases); and the usual meetings and social functions. The annual dinner of the Institute was attended by the Lord Mayor of Cardiff. At the meetings there was a scientific Paper with a very practical bearing by Prof. C. A. Edwards, D.Sc., F.R.S. (Principal of University College, Swansea), and a practical Paper on the mechanism and chemistry of pickling by Mr. Brian Reavell (joint managing director, Kestner Evaporating & Engineering Company, Limited).

Annual General Meeting

The eleventh annual general meeting was held on Friday morning, at the Park Hotel, when Mr. W. S. Grainger (chairman of council and hon. treasurer) presided. Mr. Grainger presented the accounts for the year ended March 31, 1945, which showed that there was a surplus for the year of £21. There had been an increase of subscriptions, due to increased membership, and a further £100 had been transferred to the research account, which stood at a total of £435. The Whittle Foundation account totalled £111. The accounts were unanimously adopted.

Chairman's Report

In a brief report on the Institute's affairs, MR. GRAINGER said that at the end of the financial year the membership had totalled 215, as against 195 a year previously; and that morning the Council had elected a further 11 members. The 215 were made up of nine associates, 30 associate members, 72 members, 103 member firms, and one honorary member.

The Council was doing a considerable amount of work through committees, which had co-opted certain members. The committees operating during the past year were the Technical Committee; the British Standards Institution Sub-committee; the Equilibrium Diagram Sub-committee; the Bathroom Colours Sub-committee; the Colour Sub-committee; the Standards of Resistance Sub-committee; the Literary Committee; the Whittle Foundation Committee; the Library Committee; the Research Committee, and a sub-committee dealing with the examination of raw materials for the Ministry of Supply. Ways and means were being devised to ensure that the membership of the Institute was kept informed of the work being done by the various committees.

Re-election of President

Having had the benefit of the valuable services of Mr. John W. Gardom, M.Cons.E., A.M.I.Mech.E., as president for the past year, the Council recommended that he be elected for a second year. MR. W. S. GRAINGER, proposing Mr. Gardom's re-election, said he had done a great deal since the beginning of the Institute's activities. He had served as chairman of Council and chairman of several committees, including the Technical Committee; and altogether he had rendered yeoman service. The motion was seconded by Mr. Charles, and was carried unanimously.

The PRESIDENT, expressing his appreciation of the honour, said he accepted it willingly because he liked it; and he liked it because he was a keen technical institute man and was happy to be able to help a little. He hoped he would always be called upon whenever he could help. It was perhaps a good idea to re-elect a president for a second year, for it was perhaps not too easy to get the hang of the affairs of such a body in a year.

President-elect

The PRESIDENT said it had been agreed by the Council that there should be appointed a president-elect, who normally would follow by becoming president, and who would in the meantime have opportunities to become closely acquainted with the inner workings if the Institute. He proposed, on the Council's recommendation, that Mr. R. J. Rogers be appointed president-elect. Mr. Rogers was a member of the Council of the Institution of Gas Engineers and a member of a number of committees in that Institution; a member of Council of the British Standards Institution; past-chairman of the Council of the Society of British Gas Industries, and chairman of the lighting section of that Society; past-chairman of the Midland Gas Association and of the Midland Gas Salesmen's Circle. The proposal was seconded by Mr. Somers, and carried unanimously.

MR. ROGERS, expressing his appreciation of the honour, recalled that he was one of the original members of the Institute, which had always had his support. So far as lay in his power, he would do whatever he could to further the interests of the Institute and its members.

It was announced that the following had been elected to the Council:—Mr. H. H. Aston; Mr. V. C. Faulkner, and Mr. E. Marks.

Annual Dinner

The Institute had the opportunity to entertain many distinguished guests at the annual dinner, which was held on Friday at the Park Hotel. Mr. J. W. Gardom presided.

The Loyal Toast having been honoured, MR.

Institute of Vitreous Enamellers

ALASTAIR MCLEOD proposed "The City of Cardiff and its Industries," and in so doing he complimented the Welsh people on their many claims to fame, in respect of coal production, iron and steel, and in many other directions. Not only was Cardiff the principal British port for the export of coal, but the rolling mill industry had started in Monmouthshire, the first rolled sheet being produced in Wales. Not only had Wales produced the best technique for rolling steel, but also the best scientific skill in its production. In their visits to the industrial undertakings in South Wales the members of the Institute had found there nine-tenths of their requirements for the production of the articles they had in mind for the future. The excellence of the scientific work that was being done was exemplified by the lecture delivered that morning by Prof. C. A. Edwards, and it was that type of work which put Welsh steel making at the top of the world.

It was indeed a great pleasure for the members of the Institute to visit Cardiff, where they had seen plants of which the nation could well be proud. They had enjoyed a wonderful reception. He was privileged, therefore, to propose the toast, and to couple with it the name of the Lord Mayor of Cardiff.

The LORD MAYOR (Alderman Walter R. Wills, J.P.), in his response to the toast, said that Cardiff was always pleased to welcome visitors, and was very proud to have the members of the Institute there. Cardiff had been looking ahead in every sense; while they were producing war materials they were also preparing for after events. More than £1,500,000 had been spent on extending the electricity station, and they were prepared for all the industries they could get. The water supply had been increased and was still increasing. Thus, there were facilities for new industries; and the electricity supply was one of the cheapest in the Kingdom. There was also plenty of ground available.

MR. R. DIGBY SMITH (representing the Chief Inspector of Electrical and Mechanical Engineering Equipment for the Ministry of Supply, and who was responsible for specifications in respect of housing supplies, and was devising specifications for enamels for kitchen equipment), proposed "The Institute of Vitreous Enamellers and the Vitreous Enamelling Industry." He was privileged to do so, he said, for it gave him the opportunity to thank the members of the industry, both collectively as an Institute and individually, for the welcome they had extended to him and for the great assistance they had given him, which had made his job a great deal easier than it would otherwise have been. He mentioned particularly Mr. W. Thomas, the hon. secretary of the Institute, whose unfailing good humour and patience had led him willingly to undertake any investigation or inquiries which would further the interest they had in common, *i.e.*, the establishment of fair and reasonable standards within the industry, which would enable the producers to plan their operation, and the purchasers to estimate and plan.

Institute's Progress

Offering congratulations on the establishment of an Institute which was vigorous and alive, Mr. Digby Smith said that after a comparatively short life of about 10 years the Institute had become generally respected and acknowledged throughout its industry and numerous associated industries. No higher compliment could be paid to any technical institution. It was deserving of the highest confidence because it had kept clearly in mind the fundamental objective of every technical institution, perhaps the only legitimate one, *i.e.*, the preservation and elevation of standards of performance and technique within its industry. That was something of which it could be justly proud.

The people of this country, he continued, would look to the vitreous enamellers for an enormous volume of vitreous enamelled goods of every kind during the next few years in the reconstruction of their homes. There was perhaps in the minds of ordinary men in the street a slight prejudice against vitreous enamel; the performance of the industry during the next two or three years would determine whether that prejudice would persist or would be thrown overboard. But, from what he knew of the men in the industry and from what he had seen of their work during the past 12 months, he believed they would overcome it.

The PRESIDENT, responding, said there were two major items with which technical institutes should deal. One was that of qualifications. He felt it more necessary to-day than ever before that young men should have qualifications which would prove that they were suitably trained to do the work which would be entrusted to them. He urged that young men, who, for reasons beyond their own control, had been unable so far to take the necessary courses should have the opportunity to qualify at a later date. Bodies such as the Institute of Chemistry and the newly-formed Institution of Metallurgists laid themselves out to do that job.

A second major item, and one with which the I.V.E. had to deal, was to provide opportunities for the exchange of views and for the discussion of problems and difficulties related to the industry. As a champion of the technical man, the president said he must be a man of good training, intelligence and integrity, a man who did not think too much about money, but who derived his satisfaction from a job of work well done. At the same time, it seemed strange that an executive, who could direct the labour of 1,000 or more men and could bring to those men in the correct sequence the materials they required, should be hampered and embarrassed by his personal expenditure. Such men must naturally feel disheartened. But the president felt that in the very near future the technical men must come into their own. For long he had stressed that the technical man must be given a more important position in industry, and he foresaw the possibility of the birth of the "technocrat"; such a man would be an aristocrat of the technical world, one who had absorbed some of the business man's

(*Continued on facing page, col.* 2.)

FATIGUE STRENGTH OF CRANKSHAFTS

The annual report of the Automobile Research Committee of the Institution of Automobile Engineers contains the following reference to cast-iron crankshafts.

The bending fatigue testing machines of crankshafts have been employed during the year on tests of both forged steel and cast-iron crankshafts. A report has been published on certain aspects of the fatigue strength of forged-steel crankshafts, including the effects of drilling lightening holes in crankpins and main journals, of shot peening the fillets, and of straightening the shaft. Work is now in progress on the effect of fillet radius. Tests of this nature are carried out as crankshafts for test become available, since the supply of forged crankshafts to carry out a systematic programme of research has been impossible under present conditions.

It has been possible, however, to obtain a regular supply of cast crankshaft specimens of any required design, and, in view of the attention cast crankshafts are receiving at the present time, a programme of research has been drawn up for investigating the fatigue properties of these shafts. Single-throw crankshafts of one particular cast iron, all from the same foundry, are being tested to find the effect of different features of design, including fillet radius, fillet profile, surface finish, thickness and width of webs, crank throw, overlap, length and diameter of crankpin, shape of web profile, and various special designs of web and cored holes incorporating stress-relieving features. These tests are now in hand. Later, it is proposed to investigate different cast irons, cast steel, and different surface treatments, using one or more selected designs of shaft. On account of the slow rate of crack propagation in cast iron, it has been necessary to develop a special testing technique incorporating a method of detecting cracks without stopping the test. The shaft is counted as having failed when the first detectable crack appears. Using this method of test, no difference would be expected between the results obtained with the present constant-strain machines and those obtained in a constant-stress machine.

Subsidiary Tests

A series of subsidiary tests on the cast materials is also being carried out to determine whether there is any correlation between the properties of the material and the fatigue strength of the shaft. Test-pieces are being cut from test-bars cast at the same time as the crankshaft specimens and also from the crankshafts themselves. A number of transverse bending, hardness, and rotating bending fatigue tests have already been carried out. It is intended in future to carry out extensometer tensile tests, impact tests, bending fatigue tests on notched specimens, torsion tests, fatigue tests under torsion, and possibly under combined bending and torsion stresses; and also to determine the damping capacity and chemical composition, and to examine the microstructure of the materials.

The programme will be extended later to include torsional fatigue tests on the crankshaft specimens. For this purpose a special testing machine will have to be designed, as there is at present no suitable machine for such large specimens.

INSTITUTE OF VITREOUS ENAMELLERS

(*Continued from previous page.*)

abilities, and some of the manager's organisation, drive and directing force, and would help this country during the next few years to weather the storms of the voyage on which it had embarked.

Distinguished Guests

MR. H. H. ASTON (member of Council) proposed the health of the guests, a duty which afforded him the opportunity also to express the Institute's gratitude to the distinguished men, both inside and outside the industry, who were guests and who had given very valuable help. The Institute, he said, regarded their presence as a sign of their approval and as a source of great encouragement for the future.

LIEUT.-COLONEL PERCY THOMAS, O.B.E., LL.D., P.R.I.B.A., responded to the toast. The fact that, as chairman of the Wales Regional Board of the Ministry of Production, he had been responsible for the production of munitions in Wales, gave him the opportunity to pay tribute to member firms in the Institute who, outside their normal line of business, had done a great job of work in producing shells and cartridge cases during the war. Without their aid, he said, the contribution of Wales to the war effort would have been considerably reduced. Speaking of the future of industry in South Wales, he said he had no doubt the basic industries would recover from the hard times they had suffered in the past, but at the same time it was essential in the future to balance those basic industries with light goods production. That meant the building of factories, and steps had been taken to meet the demand. The attraction of light industries, such as those represented by the Institute, was the only salvation. South Wales had the necessary assets—the skill, the fuel, the transport, and the native adaptability of the people—which had been well displayed during the six years of war: properly led, the people of South Wales could make a very worthy contribution.

To the enamelling industry he gave a word of advice in regard to design, which he hoped would receive very much more attention in the future than it had received in the past. He knew that the members of the Institute appreciated the importance of good design, but he emphasised that if we were to survive in the face of international competition in the post-war world, we must have household articles which were not only well made and efficient, but also well designed. In respect of design the standard in other countries had been rather higher than in this country. Good design meant good business.

THE CONTROL OF BALL AND ROLLER BEARINGS (NO. 1) ORDER, 1941, has been revoked.

BOMBING OF GERMANY

EFFECT ON STEEL PRODUCTION

The effects of strategic bombing on the German steel industry are discussed in a summary report of the United States Strategic Bombing Survey, issued by the U.S. Information Service.

The United States Strategic Bombing Survey was established by the Secretary of War on November 3, 1944, pursuant to a directive from the late President Roosevelt. It made a close examination and inspection of several hundred German plants, cities and areas, amassed volumes of statistical and documentary material, including German Government documents; and conducted interviews and interrogations of thousands of Germans, including virtually all of the surviving political and military leaders.

Germany began the war with approximately 23,000,000 metric tons per year of steel capacity, about 69 per cent. of which was in the Ruhr. The 1940 victories added another 17,000,000 tons, principally in Lorraine, Belgium and Luxemburg. However, official records and those of the industry for the war years, supplemented by interrogation, show that the 40,000,000 tons theoretical capacity was never reached, the survey report states. Production in the occupied countries was always troublesome and deficient. In spite of the considerable efforts to develop low-grade ores in Germany proper and medium-grade ores in Austria, Germany throughout the war continued to be primarily dependent on Swedish, Norwegian and French ores.

Poor Allocation System

Unlike Britain and the United States, Germany did not have to find steel to build a large merchant fleet or for a programme of heavy naval construction. Nor did she have to build a complete munitions industry in the middle of the war. For these reasons the German steel supply for finished munitions was only slightly less liberal than that of the United States. Although steel was considered a bottleneck by the Germans, a detailed examination of the control machinery, together with interrogation of officials in the Speer ministry and its predecessor organisations, reveals that the trouble was partly an inefficient allocation system and partly, in the early years of the war especially, an unwillingness to cut out non-essential construction and civilian consumption. German industrialists were also found to have had a marked propensity to hoard steel.

Throughout the war there was considerable debate whether the German steel industry was a desirable target—and especially whether steel mills were vulnerable to the type of attack that could be made. In 1943 the R.A.F. made a modest attack on the steel industry of the Ruhr, but the attack was given up because it was believed to have been too costly for the results achieved. Production records taken by the Survey shows, in fact, that it had some effect; production in the Ruhr declined by approximately 10 per cent. during the attack, and did not fully recover during the remainder of the year. German steel producers were required by the Government to keep records of production losses and their causes. These records show that air raid alerts in 1943 were a more serious cause of the lost production than the actual damage from the raids.

Attacks on the Ruhr

During the last half of 1944 both the cities and the transportation system of the Ruhr were the targets of extremely heavy attack, primarily by the R.A.F. Production of steel in the Ruhr was reduced to 80 per cent. between June and the end of the year. Loss of production of high-grade steel in the Ruhr was greater than the loss of Bessemer steel, and high-grade steel became a bottleneck by the middle of 1944. German steel production for all the Reich and occupied countries declined from 2,570,000 metric tons in July to 1,000,000 metric tons in December. Of this loss about 490,000 tons was the result of loss of territory.

Examination of the steel plants showed that, although the attack damaged some blast furnaces, open hearths and rolling mills, it was primarily effective through damage to utilities (electricity, gas and water) and communications within the plants and to utilities and transport supplying the plants.

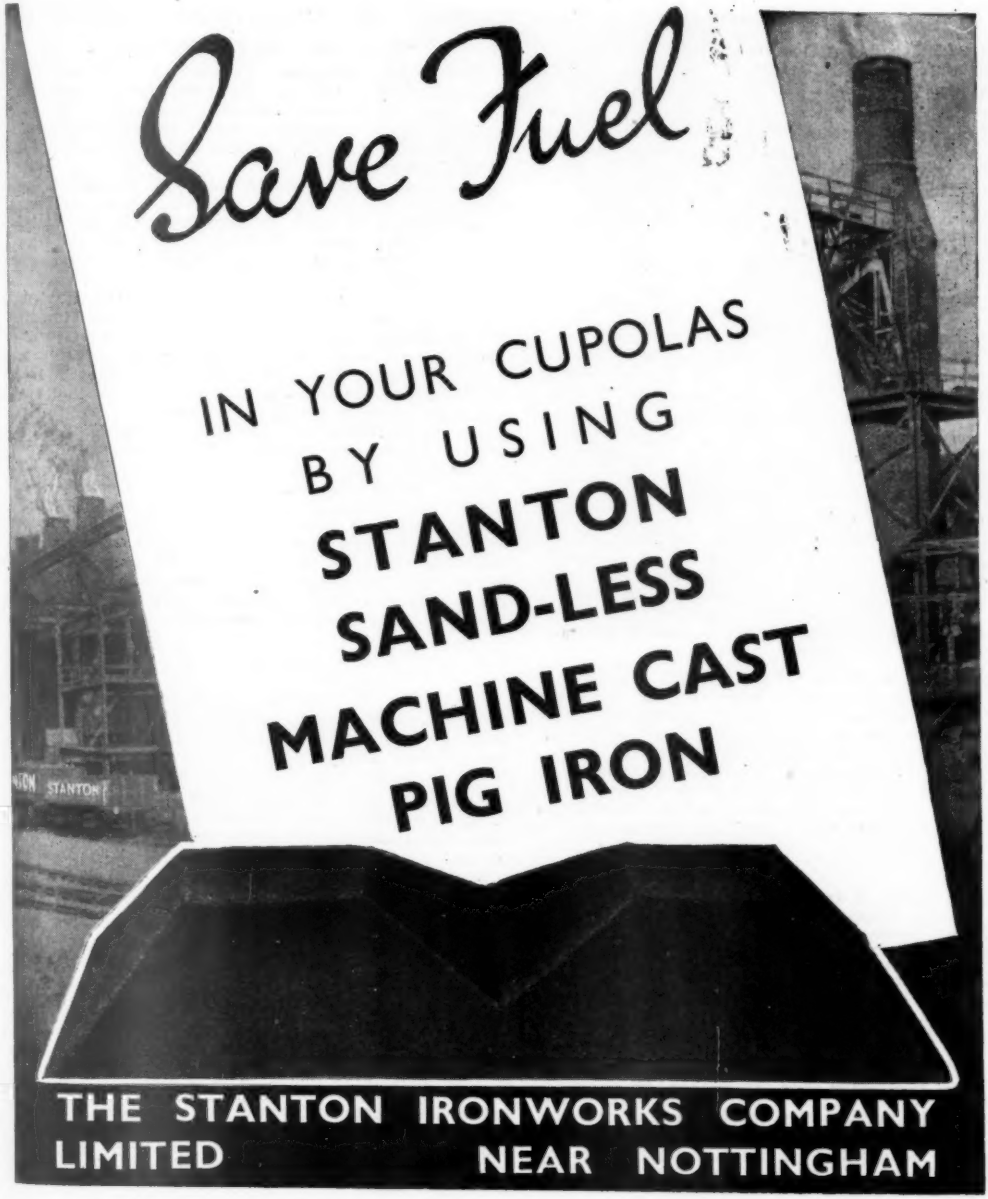
Although steel production had been reduced to critical levels by the end of 1944 and continued to fall until the end of the war, Survey studies do not indicate that the steel shortage (unlike the oil shortage or even the ammunition shortage) was decisive. It might have been decisive if the war had continued, and if this specific shortage had not been overshadowed by the disintegration of the whole economy. As it developed at the end of the war, certain German industries had inventories of steel that ranged from comfortable to generous.

CONSUMPTION OF NON-FERROUS METALS

Detailed figures of the consumption in the United Kingdom during the third quarter of 1945 of the metals within the scope of the Directorate of Non-Ferrous Metals, namely, copper, zinc, lead, tin, nickel, cadmium, antimony, cobalt and manganese, have now been issued. The total figures of consumption of virgin metal only for 1944 and the first three quarters of 1945 are as follow:—

	Year 1944	First quarter, 1945	Second quarter, 1945	Third quarter, 1945
	Tons	Tons	Tons	Tons
Copper	348,139	81,103	72,378	65,244
Zinc	184,241	45,411	43,109	40,290
Lead	205,385	51,517	55,265	55,274
Tin	18,435	3,949	4,067	3,959
Nickel	12,420	2,431	2,214	1,966
Cadmium	377	114	121	101
Antimony	4,772	1,265	1,348	1,284
Cobalt	787	195	168	158
Manganese metal	861	144	134	107

In almost every metal, consumption in the third quarter was below previous levels. This is particularly true of copper and nickel. The decline reflected the reduced demand for munitions in the later stages of the German and Japanese wars.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PERSONAL

MR. J. R. BACON, A.M.I.Mech.E., has left the Dudley Foundry Company, Limited, to become managing director of Auto-Malleable (Bingley), Limited, Phœnix Foundry, Bingley, Yorks.

MR. VERNON PROCTOR, Regional Controller for the Ministry of Supply for the last four years, with his headquarters in Sheffield, is soon retiring. He is joining R. Hostombe, Limited, of Sheffield.

MR. J. BLAKISTON, A.M.I.Mech.E., has resigned his position as foundry manager to Modern Foundries, Limited, to establish himself in business as a consultant engineer. His address is 10, Heath Hall, Halifax, Yorks.

MR. C. W. PARKES, chairman of Josiah Parkes & Sons, Limited, non-ferrous founders, etc., of Union Works, Willenhall, has been elected vice-chairman of the Board of Governors of the Royal Hospital, Wolverhampton.

MR. L. C. ROW, who for many years has been works manager at the Chorley works of Leyland Motors, Limited, has joined the board of Rhodes, Brydon & Youatt, Limited, of Stockport, to be joint managing director with Mr. Norman Youatt.

MR. W. ASHWORTH, B.Sc., F.L.A., A.R.P.S., has been appointed librarian to the British Cast Iron Research Association. He graduated at the University of Manchester and then took the diploma of the School of Librarianship at University College, London. Mr. Ashworth has had experience at the National Central Library and at the Imperial Smelting Corporation, Limited, Avonmouth.

MR. DOUGLAS JEPSON, M.Sc., formerly a lecturer at Bradford Technical College, where he was in charge of the Metallurgical Department, has been appointed to the newly created position of senior assistant in the Department of Metallurgy at the Central Technical College, Birmingham. He was formerly hon. secretary of the West Riding of Yorkshire branch of the Institute of British Foundrymen. Mr. Jepson has been elected to serve on the Institute's Education Committee for 1945-46.

Wills

McKINNON, C. W., of Aberdeen, retired ironfounder	£37,433
CLARK, F. E., formerly chairman of the Dudley Foundry Company, Limited	£150,300
GRAZEBROOK, FRANCIS, formerly chairman of M. & W. Grazebrook, Limited, pig-iron manufacturers and engineers, Netherton, Worcs.	£197,412

ALLIES TAKE OVER KRUPPS

A month ago the Allied Military Government took over possession and control of all property owned by Krupps of Essen and their subsidiary and affiliated undertakings. The management of the concern is to be dissolved, and those holding managerial posts will be required to place themselves at the disposal of the controller and continue their duties until further decisions have been taken.

SURVEY OF INDUSTRIAL RESEARCH

TWO F.B.I. QUESTIONNAIRES

The F.B.I. Industrial Research Committee and Secretariat have sent out questionnaires to establish the facts of Britain's industrial research. In the opinion of the Committee, British industry's research effort has been greatly underestimated, because it is largely unknown.

One questionnaire is addressed to all manufacturing concerns in the country that are carrying out research and development, and the second to all firms and organisations offering facilities to industry of an analytical, testing, consultant, research or development nature.

The first questionnaire seeks detailed information on the staffing and scope of a firm's research department. It asks, among other things, if the firm's laboratories cater also for other British companies; what contacts exist with universities and technical colleges; if the research department concerned wishes to be put in touch with others working in the same field, or to exchange scientific and technical information with others at home or abroad. The questionnaire embraces firms that carry out research, but have no separate research laboratory. Firms are also asked to outline any plans for development or expansion of research activities during the next two years.

The second questionnaire, which has been prepared on similar lines to the first, asks the nature of the services offered, the particular field covered by the firm or organisation, and what specialist work is undertaken and equipment possessed.

OBITUARY

MR. JOHN A. PEARSON, shipbuilding and general manager of Scotts' Shipbuilding & Engineering Company, Limited, Greenock, died on November 24. He was 65 years of age.

MR. CHARLES DODD, of Chesterfield, died recently at the age of 66. He was a partner in the firm of T. Dodd & Sons, iron and steel merchants, Chesterfield, a business founded by his father.

THE TOP FLOOR of a three-storey building was gutted, and the 150-ft. long roof destroyed, when fire broke out at the ironfoundry of John Needham & Sons, Limited, Carrington Road, Stockport. It was stated by an official of the company that the damage would put them six weeks behind in production.

THE NATIONAL ARBITRATION TRIBUNAL, in their Award No. 787, have rejected a claim by members of the National Union of General and Municipal Workers employed by members of the No. 1 Division of the Iron and Steel Trades Employers' Association, Dalzell Steelworks, Motherwell, being bricklayers' labourers and others covered by Awards Nos. 1794 and 1814 of the Industrial Court. The claim was for the application to labourers, including platelayers, of the tonnage bonus paid to bricklayers, with a minimum payment of 10s. per week.

Design by Eric Fraser

MOSAICS OF STEEL

NUMBER TEN

At the Stocksbridge plant of Samuel Fox and Company Limited, steel is melted both by the electric arc and by high frequency induced currents, of which latter process the firm were amongst the pioneers. Of several methods of melting steel, electrical melting is accepted as giving the highest quality to withstand great stresses without failure. Electric steel is therefore synonymous with metallurgical progress in such highly developed mechanisms as the aircraft engine, the motor vehicle and other machines in which lightness, strength and reliability must be matched together. Alloy steels containing such metals as chromium, nickel, tungsten, molybdenum and other rare elements, are all produced by electric melting which permits of close and accurate control of all metallurgical reactions. There is a large and increasing number of these quality alloy steels designed, as a result of research, to meet such special conditions as high temperatures, corrosion and acid resistance, abrasion, and many other difficult engineering conditions.

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NEWS IN BRIEF

MR. HAROLD HOBSON, chairman of the Central Electricity Board, stated in London recently that the electricity industry was embarking on a five-year expansion plan, costing £450 million.

THE PRESIDENT OF THE BOARD OF TRADE has appointed a committee under the chairmanship of Sir Clive Baillieu to frame detailed proposals for the formation of a British Institute of Management.

DETAILS ARE NOW AVAILABLE on application—enclosing a stamped addressed envelope—to the Central Institute of Art and Design, P.O. Box No. 213, 9, Kean Street, London, W.C.2, of the £1,500 prize competition, open to all British subjects, covering the design of everyday things in the home.

METAL INDUSTRIES, LIMITED, which already holds 509,303 out of the 700,000 issued 2s. ordinary and 201,425 of the 300,000 issued 6s. 6 per cent. preference shares of Sentinel (Shrewsbury), Limited, formerly Sentinel Waggon Works, Limited, has made a cash offer to acquire from the holders the balance of the issued capital. The offer involves a sum of £61,793.

VICKERS-ARMSTRONGS, LIMITED, have received an order from the Peninsular & Oriental Steam Navigation Company for a passenger liner for their China service. This is in addition to the order for a vessel for the Australian service which has already been announced. The vessel is to be of about 23,000 tons displacement and will be laid down at Barrow during the summer of 1946.

TWO FIRMS have been elected members of the British Cast Iron Research Association:—W. A. Baker & Company, Limited, Newport, Mon. (representative, Mr. H. H. Biss), and the Harborough Construction Company, Limited, Market Harborough (representative, Mr. A. Tipper, M.Sc.). The latter concern joins as a trade member. Mr. B. N. Reavell, of London, joins as an associate member.

THE DIRECTORS OF Turner & Newall, Limited, manufacturers of asbestos, magnesia, and allied products, have decided to provide funds for eight research fellowships in engineering, inorganic chemistry or physics, or allied sciences, these fellowships to be financed by them for a period of seven years. The fellowships, are to be established at specified universities in areas in which the company has certain of its larger factories. Each will be worth £600 a year.

THE FOLLOWING FIRMS are engaged on the assembly of the aluminium house:—A. W. Hawkesley, Limited, Hucclecote, Gloucester; Blackburn Aircraft Company, Clyde Factory, Dumbarton; Bristol Aeroplane Company, Weston-super-Mare; Vickers-Armstrongs, Limited, Blackpool; Vickers-Armstrongs, Limited, Chester. At present the factories at Weston-super-Mare, Blackpool and Chester are operated by the firms as agents of the Ministries of Supply and Aircraft Production.

STIRLING EDUCATION COMMITTEE has appointed three representatives and the Director of Education to meet representatives of the National Light Castings Ironfounders' Federation to consider the Federation's suggestions for co-operation in interesting schoolboys in ironfounding along lines similar to those at present existing in the Falkirk Trades School in relation to the training of boys for the building industry, and also to consider the inclusion of ironfounding in the lay school curriculum.

NORDAC, LIMITED, chemical engineers, are in the process of acquiring the business of S. Porter & Company, of 71, Scrutton Street, London, E.C.2. This firm was established 35 years ago, as chemical plumbers, lead burners, suppliers of lead-lined tanks, homogeneous lead lining and chemical lead-work generally. The works staff are to continue. Nordac, Limited, will carry on the business under the name of S. Porter & Company, Limited, with registered offices at Dukes Road, Western Avenue, London, W.3, and works at 71, Scrutton Street, E.C.2.

WILMER & SONS (1939), LIMITED, Bow Bridge Ironfoundry, 52-62, High Street, Stratford, London, E.15, have changed their name to Wilmer Lea Foundries, Limited. The premises of Lea Foundry (Bow), Limited, were totally destroyed by enemy action in March, 1941, and their activities were continued for a short time at the works of Wilmer & Sons (1939), with Mr. S. D. Hutchison acting as managing director of both firms. In 1942 the two firms were amalgamated. A mechanised plant is being installed in a separate part of the premises in order to increase output and to cope with post-war requirements and developments.

GIVING AN ACCOUNT of the progress made in the reconversion of industry to civilian production and export trade, Sir Stafford Cripps, President of the Board of Trade, said that the change-over had always been expected to take nine months, but in much less time good progress had been made. The preparatory stages to get increased production were going on very well. Before long larger output would be seen. He referred to hindrances caused by bottlenecks in labour, in the supply of materials—in some cases materials the output of another industry—and in engineering, including textile engineering; and to the serious difficulty of obtaining castings, again the consequences of difficulty in recruiting labour for the foundries.

IN THE FIRST NINE MONTHS of this year Eire imported iron and steel and manufactures to the value of £1,230,203, as compared with £746,206 for the same period in 1944. The September figure was £214,509, against £69,727. In the nine months imports of pig-iron made £20,647, against £18,885; iron and steel manufactures, fabricated, £14,166, against £1,075; manufactures, not fabricated, £45,911, against £7,060; cast-iron pipes, £34,898, against £9,555; railway material, £22,945, against £9,773; tanks, cisterns, etc., £5,245, against £745; hollow-ware, £55,222, against £23,894. Imports of non-ferrous ores, metals and manufactures for the same period totalled £359,583, against £110,051, the September figure being £57,420, against £11,373.

TO SLAG PENETRATION

SLAG penetration of refractory materials normally accompanied by erosion, surface spalling, shrinkage, etc., is frequently responsible for the ultimate failure of refractories. To reduce the destructive effect of slag penetration, volume-stable, dense, low-porosity, low-permeability bricks, with the correct chemical composition, must be used. A characteristic of G.R. products is that they possess these necessary qualities and thus ensure minimum slag penetration. The services of G.R. engineers are available on request, to users, on the choice and application of refractories.

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Raw Material Markets

IRON AND STEEL

Foundries engaged in the production of light castings are much busier than general engineering and jobbing foundries and consequently there is not such heavy pressure for refined and low-phosphorus iron as for common foundry grades. The position is, however, sound. Aggregate output of pig-iron has been increased by the more extensive use of high-grade ores and could be further expanded. The labour problem in the foundries, though a trifle easier in places, is still acute, and continues to hamper operations.

The release of the first consignments of billets imported from the Dominions has eased the position at the re-rolling mills, where anxiety concerning the maintenance of adequate supplies of material had become acute. The improvement, however, is relatively slight. Supplies are by no means abundant, and provision will have to be made for much bigger tonnages of both billets and sheet bars if the mills are to execute all orders. Illustrative of the urgency of the demand is the fact that re-rollers are as keen as ever to acquire defective billets, crops, etc.

The heavy steel mills are turning out large quantities and will need so to continue if they are to avoid heavy arrears at the end of December. Structural steel is now coming more prominently into the rolling programmes, while the plate mills have more work in hand than at any previous period this year. Further substantial export orders have been placed, and it may soon be difficult to get any assurance of delivery within Period I of next year. The demand for railway and colliery equipment suffices to keep this branch of the industry fully employed, while sheet makers are now indicating Period II as the earliest delivery date for black and galvanised sheets.

NON-FERROUS METALS

The non-ferrous metals markets show little change from week to week. There is no real shortage of metal and users are able to satisfy their requirements without difficulty. When it comes to manufactured goods the story is different. Copper, for instance, is quite readily forthcoming, but to secure it in some of its semi-finished or finished forms may mean waiting for weeks, or even months. The labour situation, of course, is the trouble here, and there will be no real improvement until demobilisation is more of a fact than a promise. Sales of all metals remain under Government control and the resumption of trading on the London Metal Exchange seems to be as far off as ever.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

McKendrick Adams & Holden, 2, Norfolk Street, London, W.C.2—Dealers in metal, etc. £1,000. M. J. McKendrick, C. E. Adams, and J. W. Holden.

M.R.B. (Birmingham), 1, Chatham Road, Northfield, Birmingham—Sheet metal workers, engineers, etc. £3,000. W. P. G. Mackee, R. N. Rodway, and G. W. Blockley.

E. Hayward & Company (Fabrications), Cephas Works, Acorn Street, Willenhall, Staffs—Fabricators, sheet-metal workers, welders, etc. £3,000. E. Hayward.

Canterbury Manufacturing Company, 39, St. Margarets Street, Canterbury—Tool, pattern and machinery designers, engineers, etc. £1,000. E. C. Sayer and F. W. Friday.

Skyhi, Bush Lane House, Cannon Street, London, E.C.4—Mechanical, electrical and hydraulic engineers, etc. £10,000. A. I. Logette, M. A. Ingram, A. H. Stead, and W. T. S. Weir.

Aspec (London), Terminal House, Grosvenor Gardens, London, S.W.1—Gas, electrical and mechanical engineers, etc. £10,000 H. W. Woodall, H. P. Barker, R. Connor, A. L. Gandon, and F. E. Gluck.

Marshall Electric (1945) Company, Waverley House, 37, West Gate, Mansfield, Notts—Electrical and mechanical engineers. £1,000. F. H. and C. M. Marshall, E. and A. Davidson, and G. K. Burrows.

Aluminium Development Association ("Limited" omitted from title by licence of Board of Trade)—G. Cunliffe, 3, Upper Grosvenor Street, London, W.1, D. C. Brookes, H. W. Clarke, H. E. Jackson, A. Reynolds, E. Player, and H. C. Herrington.

Edge Tool Industries, Chillington Tool Works, Wolverhampton—To take over all or part of the assets and liabilities of the Associated Edge Tool Industries, Limited (in liquidation). £400,000. J. K. Hunt and four other directors of Chillington Tool Company, Limited; H. T. Elwell and four other directors of Edward Elwell, Limited; F. D. Yates and B. Thomas.

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